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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a main point view explaining the composition of the hybrid driving gear of hybrid vehicles equipped with the control unit which is one example of this invention.

[Drawing 2] It is drawing explaining the control system with which the hybrid driving gear of drawing 1 is equipped.

[Drawing 3] It is drawing explaining the operation of the engagement element which forms each gear ratio of the automatic transmission of drawing 1.

[Drawing 4] It is drawing showing a part of hydraulic circuit with which the automatic transmission of drawing 1 is equipped.

[Drawing 5] It is drawing explaining the connection relation between the controller for hybrid control of drawing 2, and an electric-type torque converter.

[Drawing 6] It is a flow chart explaining the fundamental operation of the hybrid driving gear of drawing 1.

[Drawing 7] It is drawing explaining the operating state in each modes 1-9 in the flow chart of drawing 6.

[Drawing 8] It is drawing showing an example of the operation pattern of a shift lever.

[Drawing 9] It is a flow chart explaining the important section of the control operation used as the feature of one example that this invention was applied.

[Drawing 10] It is an example of a timing diagram when motor assistant control is performed according to the flow chart of drawing 9.

[Drawing 11] It is a flow chart explaining another example of this invention.

[Drawing 12] It is an example of a timing diagram when motor assistant control is performed according to the flow chart of drawing 11.

[Drawing 13] Correction factor FDL1 used in case the acceleration correction factor FAC is computed at Step SB3 of drawing 11 It is drawing showing an example.

[Drawing 14] It is drawing showing an example of the correction factor FTHW1 used in case the acceleration correction factor FAC is computed.

[Drawing 15] Asynchronous injection quantity TB computed at Step SB8 of drawing 11 It is drawing showing an example.

[Drawing 16] this invention is a main point view explaining another example of the hybrid driving gear of the hybrid vehicles applied suitably.

[Drawing 17] It is drawing explaining the operation of the engagement element which forms each gear ratio of the automatic transmission of drawing 16.

[Description of Notations]

12: Engine

14: Motor generator (electrical motor)

48: Accelerator operation means

50: The controller for hybrid control

Steps SA4-SA8: Assistant control means (the 1st invention)

Steps SB4-SB11: Assistant control means (the 2nd invention)

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CLAIMS

[Claim(s)]

[Claim 1] The control unit of the hybrid vehicles characterized by providing the following. The engine which operates by combustion of fuel. It has the electrical motor which operates with electrical energy as a source of power at the time of a vehicles run. In the control unit of the hybrid vehicles which carry out electronics control of the operating state of the aforementioned engine and the aforementioned electrical motor according to the accelerator control input of the accelerator operation means operated by the operator, respectively Assistant control means which the torque assistance by the aforementioned electrical motor is performed [control means] a condition [the increase in the accelerator control input of the aforementioned accelerator operation means being larger than predetermined], and give priority to the increase in the torque by this electrical motor to output change of this engine at the time of the run which makes the aforementioned engine the source of power.

[Claim 2] The control unit of the hybrid vehicles characterized by providing the following. The engine which operates by combustion of fuel. It has the electrical motor which operates with electrical energy as a source of power at the time of a vehicles run. While carrying out electronics control of the operating state of the aforementioned engine and the aforementioned electrical motor according to the accelerator control input of the accelerator operation means operated by the operator, respectively In the control unit of the hybrid vehicles which perform the increase-in-quantity amendment of fuel oil consumption to this engine at the time of the increase in the aforementioned accelerator control input at the time of the run which makes this engine the source of power Assistant control means with which the insufficiency of the torque accompanying a limit of this increase-in-quantity amendment is compensated by the aforementioned electrical motor while restricting an increase-in-quantity amendment of the aforementioned fuel oil consumption by the increase in the aforementioned accelerator control input.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to hybrid vehicles and relates to improvement of hybrid vehicles which performs the torque assistance by the electrical motor under predetermined conditions at the time of the run which makes an engine the source of power especially.

[0002]

[Description of the Prior Art] It has the engine which operates by combustion of fuel, and the electrical motor which operates with electrical energy as a source of power at the time of a vehicles run. While carrying out electronics control of the operating state of the aforementioned engine and the aforementioned electrical motor according to the accelerator control input of the accelerator operation means operated by the operator, respectively As opposed to the time of the increase in the accelerator control input, i.e., the throttle-valve opening of an engine, when an accelerator control input is large The hybrid vehicles which perform the torque assistance by the electrical motor while restricting change of throttle-valve opening are indicated by JP,63-284030,A. According to such hybrid vehicles, since sudden increase of the throttle-valve opening of an engine is avoided, NVH (noise, vibration, degree of comfort), mpg, emission, etc. improve.

[0003]

[Problem(s) to be Solved by the Invention] However, while the cure of enlarging accumulation-of-electricity capacity of accumulation-of-electricity equipment, or making [many] a charge opportunity with an engine was required since the operating frequency and power consumption of an electrical motor increased when the torque assistance by the electrical motor was always performed in this way at the time of the increase in an accelerator control input, there was a problem that the endurance of an electrical motor was spoiled.

[0004] The place which succeeded in this invention against the background of the above situation, and is made into the purpose is to lessen the operating frequency and power consumption of an electrical motor as much as possible, satisfying the demand to NVH, mpg, emission, etc.

[0005]

[Means for Solving the Problem] The engine in which the 1st invention operates by combustion of fuel in order to attain this purpose, It has the electrical motor which operates with electrical energy as a source of power at the time of a vehicles run. In the control unit of the hybrid vehicles which carry out electronics control of the operating state of the aforementioned engine and the aforementioned electrical motor according to the accelerator control input of the accelerator operation means operated by the operator, respectively At the time of the run which makes the aforementioned engine the source of power, the torque assistance by the aforementioned electrical motor is performed a condition [the increase in the accelerator control input of the aforementioned accelerator operation means being larger than predetermined]. It is characterized by having the assistant control means over which priority is given to the increase in the torque by the electrical motor to output change of an engine.

[0006] The 2nd invention is equipped with the engine which operates by combustion of fuel, and the electrical motor which operates with electrical energy as a source of power at the time of a vehicles run. While carrying out electronics control of the operating state of the aforementioned engine and the aforementioned electrical motor according to the accelerator control input of the accelerator operation means operated by the operator, respectively In the control unit of the hybrid vehicles which perform the increase-in-quantity amendment of fuel oil consumption to the engine at the time of the increase in the aforementioned accelerator control input at the time of the run which makes the engine the source of power While restricting an increase-in-quantity amendment of the aforementioned fuel oil consumption by the increase in the aforementioned accelerator control input, it is characterized by having the assistant control means with which the insufficiency of the torque accompanying a limit of the increase-in-quantity amendment is compensated by the aforementioned electrical motor.

[0007]

[Effect of the Invention] Since the torque assistance by the electrical motor is performed a condition [the control unit of the hybrid vehicles of the 1st invention being larger than predetermined, the increase in an accelerator control input, i.e., the increase width of face in the rate of increase or a predetermined time,], as compared with the case where the torque assistance by the electrical motor is always performed, the operating frequency and power consumption of an electrical motor are reduced at the time of the increase in an accelerator control input. Since aggravation of NVH, mpg, and emission becomes remarkable when especially the increase in an accelerator control input is large, when the increase in an accelerator control input is smaller than predetermined, even if an engine output is increased according to the increase, NVH, mpg, and emission are not spoiled greatly.

[0008] In order to compensate the insufficiency of the torque accompanying a limit of the increase-in-quantity amendment with the control unit of the hybrid vehicles of the 2nd invention by the electrical motor while an increase-in-quantity amendment of the fuel oil consumption by the increase in an accelerator control input is restricted, the operating frequency and power consumption of an

electrical motor are reduced without spoiling NVH, mpg, and emission greatly. Since fuel oil consumption is fundamentally controlled according to an accelerator control input, the amount of assistance by the electrical motor is comparatively small, and ends.

[0009]

[Embodiments of the Invention] Here, this invention may be applied to the hybrid vehicles of various types equipped with the engine and the electrical motor as a source of power at the time of a vehicle's run, such as a change type which switches the source of power, and composition of an epicyclic gear drive etc., a mix type which compounds or distributes the output of an engine and an electrical motor by the partition system, by connecting and intercepting power transfer with a clutch. It is also possible to arrange an electrical motor for every driving wheel.

[0010] Although this invention is natural when running an engine only with an engine about the control at the time of the run made into the source of power, it may be applied when running using both an engine and an electrical motor. In addition, other operation modes, such as motor operation mode which runs only an electrical motor as a source of power, are carried out according to operational status, such as an accelerator control input and the amount SOC of accumulation of electricity of the vehicle speed and accumulation-of-electricity equipment (accumulation-of-electricity state).

[0011] The assistant control means of the 1st invention are constituted so that it may carry out by giving priority to the torque assistance by the electrical motor, for example, increase of an engine output may be suppressed by the assistance at the time of rapid increase of NVH, mpg, and an accelerator control input by which emission is spoiled greatly. Although the assistant control means of the 2nd invention are constituted so that an increase-in-quantity amendment of fuel oil consumption may not exceed a predetermined value, they forbid an increase-in-quantity amendment of fuel oil consumption, namely, may not be made not to perform an increase-in-quantity amendment of the fuel oil consumption by the increase in an accelerator control input substantially. the amount of torque assistance and the amount of suppression of an engine output (the amount of reduction from the increase in original) by the electrical motor -- abbreviation -- although the same thing is desirable, even if some differences are between them etc., it does not interfere

[0012] That assistant control means should just be what suppresses increase of an engine output as a result. For example, at the time of the run which makes an engine and an electrical motor the source of power, the motor torque of an electrical motor is raised more greatly than usual. Rotation torque is given to an electrical motor when the electrical motor is carrying out free rotation only of the engine at the time of the run made into the source of power. When the electrical motor is performing charge control as a generator at the time of the run which makes only an engine the source of power, according to the operating state of an electrical motor, it can carry out reducing motor torque (regenerative-braking torque) etc. in various modes.

[0013] As an increase-in-quantity amendment of the fuel oil consumption by the increase in an accelerator control input, two kinds, crank angle synchronous injection and asynchronous injection, are known, and although you may be the case where it applies only to the either, applying to both is also possible. An increase-in-quantity amendment of synchronous injection is asked for the amount of changes of load, engine water temperature, etc. which are predicted from change of for example, an accelerator control input as a parameter, and an increase-in-quantity amendment of asynchronous injection is asked for the rate of change of the throttle-valve opening predicted from change of for example, an accelerator control input etc. as a parameter. the amount of changes of load -- for example, variation $\Delta Q/NE$ of the inhalation air content per charging stroke etc. -- it is .

[0014] Hereafter, the example of this invention is explained in detail, referring to a drawing. Drawing 1 is the main point view of the hybrid driving gear 10 of hybrid vehicles equipped with the control unit which is one example of this invention. This hybrid driving gear 10 is for FR (front engine Riyadh live) vehicles, is equipped with the engines (gasoline engine etc.) 12 which operate by combustion of fuel, the motor generator 14 used as an electrical motor and a generator, the single pinion type epicyclic gear drive 16, and the automatic transmission 18 along with the cross direction of vehicles, and transmits power to a driving wheel (rear wheel) on either side through a driveshaft, a differential gear, etc. which are not illustrated from an output shaft 19. An epicyclic gear drive 16 is the synthetic partition system which allots the force a compounded part mechanically, the electric-type torque converter 24 is constituted with the motor generator 14, and the starter-ring 16r is the 1st clutch CE 1. It minds, connects with an engine 12, and connects with rotor-shaft 14r of a motor generator 14 sun gear 16s, and carrier 16c is connected with the input shaft 26 of an automatic transmission 18. Moreover, sun gear 16s and carrier 16c is the 2nd clutch CE 2. It is connected. In addition, the output of an engine 12 minds the damper gear 30 by elastic members, such as the flywheel 28 for suppressing rotation change and torque change and a spring, and rubber, and it is the 1st clutch CE 1. It is transmitted. The 1st clutch CE 1 It reaches and is the 2nd clutch CE 2. It is the multiple disc clutch of the friction formula engaged and released by each with an actuator.

[0015] An automatic transmission 18 combines the auxiliary transmission 20 which consists of a front-end formula overdrive planetary gear unit, and the main change gear 22 of four steps of advance, and one step of go-astern which consists of a simple-concatenation 3 planetary gear train. Specifically, auxiliary transmission 20 is the single pinion type epicyclic gear drive 32, the hydraulic clutch C0 made to carry out friction engagement with an actuator, and a brake B0. One way clutch F0 It is had and constituted. The main change gear 22 is 3 sets of single pinion type epicyclic gear drives 34, 36, and 38, the hydraulic clutch C1 made to carry out friction engagement with an actuator, C2, a brake B1, B-2, B3, and B4. An one way clutch F1 and F2 It is had and constituted. And excitation of the solenoid valves SL1-SL4 shown in drawing 2 , By a hydraulic circuit's 44 being switched by un-exciting, or switching a hydraulic circuit 44 mechanically by the manual shift bulb mechanically connected with the shift lever 40 The clutches C0 and C1 which are engagement meanses, C2, a brake B0, B1, B-2, B3, and B4 It is engaged, release control is carried out, and each gear ratio of a neutral (N), five steps (1st-5th) of advance, and one step (Rev) of go-astern is formed, respectively, as shown in drawing 3 . In addition, the above-mentioned automatic transmission 18 and the aforementioned electric-type torque converter 24 are constituted by the abbreviation symmetrical target to the center line, and the lower half of a center line is omitted in drawing 1 .

[0016] When "O" of the column of the clutch of drawing 3 , a brake, and an one way clutch was operated to engagement and, as for "-", a shift lever 40 is operated to an engine brake range, "3", "2", "L" range, or "DM (direct mode)" range, engagement and the blank mean being un-engaged. [i.e.,] In this case, the neutral N and go-astern gear ratio Rev and an engine brake range are formed by switching a hydraulic circuit 44 mechanically by the manual shift bulb mechanically connected with the shift lever 40, and the

existence of mutual gear change of 1st-5th when a shift lever 40 is operated to D (advance) range, or the engine brake in DM range is electrically controlled by solenoid valves SL1-SL4. Moreover, the change gear ratio of an advance gear ratio becomes small gradually as it serves as 5th(s) (the 5th gear ratio) from 1st (the 1st gear ratio), and it is change-gear-ratio $i_4 = 1$ (direct connection) of 4th. The change gear ratio shown in drawing 3 is an example.

[0017] As shown in drawing 8, a shift lever 40 "P (parking)", "R (reverse)", "D (drive)", "4", "3", "2", and "L." Among these, a manual shift bulb is moved range of "N (neutral)", "D (drive)", "DM (direct mode)", "4", "3", "2", and "L." Among these, a manual shift bulb is moved corresponding to six actuated valve positions located in the vertical direction (vehicles cross direction) of drawing, and the six actuated valve positions are detected by the shift position sensor 46. "DM" range is a range which can carry out change operation of the five aforementioned advance gear ratios (engine brake operation) manually, and having been operated to "DM" range is detected by the direct mode switch 41 (refer to drawing 2). In "DM" range, while it is possible to operate a shift lever 40 to a cross direction (the vertical direction of drawing) and operation before and after the shift lever 40 in "DM" range is detected by the + switch 42 and the - switch 43, according to the number of times of operation of the + switch 42, up shifting of the automatic transmission 18 is carried out, and down shifting is carried out according to the number of times of operation of the - switch 43.

[0018] The hydraulic circuit 44 is equipped with the circuit shown in drawing 4. In drawing 4, a sign 70 shows a 1-2 shift bulb, a sign 71 shows a 2-3 shift bulb, and the sign 72 shows the 3-4 shift bulb. The free passage state in each gear ratio of each port of these shift bulbs 70, 71, and 72 is as being shown in each shift bulb 70, 71, and 72 bottom. In addition, the number shows each gear ratio.

[0019] To the brake port 74 which is open for free passage to input port 73 for the 1st gear ratio and the 2nd gear ratio among the ports of the 2-3 shift bulb 71, it is the 3rd brake B3. It connects through the oilway 75. The orifice 76 is infixed in this oilway and it is the orifice 76 and 3rd brake B3. The damper bulb 77 is connected in between. This damper bulb 77 is the 3rd brake B3. When line pressure PL is supplied rapidly, little oil pressure is inhaled and buffer action is performed.

[0020] A sign 78 is B-3 control valve, and is the 3rd brake B3. ***** is controlled. That is, for this B-3 control valve 78, the output port 83 which it has the spool 79, the plunger 80, and the spring 81 infixed among these, and an oilway 75 is connected to the input port 82 opened and closed with a spool 79, and is alternatively made open for free passage by this input port 82 is the 3rd brake B3. It connects. Furthermore, this output port 83 is connected to the feedback port 84 formed in the nose-of-cam side of a spool 79. The port 86 which outputs D-range ** (line pressure PL) is made open for free passage for a gear ratio [3rd / more than] gear ratio through an oilway 87 by the port 85 which carries out opening to the part which has arranged the above-mentioned spring 81 on the other hand among the ports of the 2-3 shift bulb 71. Moreover, the linear solenoid valve SLU is connected to the control port 88 formed in the edge side of a plunger 80, and it is ***** PSLU. It is made to act. Therefore, B-3 control valve 78 is ***** PSLU which pressure regulation level is set up with the elastic force of a spring 81, and the oil pressure supplied to a port 85, and is supplied to a control port 88. It is constituted so that it is high, and the elastic force by the spring 81 may become large.

[0021] The sign 89 in drawing 4 is a 2-3 timing bulb, and this 2-3 timing bulb 89 has the 2nd plunger 93 with which the 1st plunger 91 has been arranged at the opposite side on both sides of the spool 90 and the 1st plunger 91 in which the land of a minor diameter and the land of two major diameters were formed, the spring 92 arranged among these, and the spool 90. An oilway 95 is connected to the port 94 of the pars intermedia of the 2-3 timing bulb 89, and this oilway 95 is connected to the port 96 made open for free passage for a gear ratio [3rd / more than] gear ratio by the brake port 74 among the ports of the 2-3 shift bulb 71. An oilway 95 branches on the way, it connects with the port 97 which carries out opening between the aforementioned minor diameter land and a major-diameter land through the orifice, and the port 98 alternatively made open for free passage by the above-mentioned port 94 is connected to the solenoid relay valve 100 through the oilway 99. And it is 2nd brake B-2 to the port which the linear solenoid valve SLU is connected to the edge of the 1st plunger 91 in the port which is carrying out opening, and carries out opening to the edge of the 2nd plunger 93. It connects through the orifice.

[0022] The aforementioned oilway 87 is 2nd brake B-2. It is for receiving, and supplying and discharging oil pressure, and the minor diameter orifice 101 and the orifice 102 with a check ball are infixed in the middle. Moreover, in the oilway 103 which branched from this oilway 87, it is 2nd brake B-2. When carrying out shell exhaust gas pressure, the major-diameter orifice 104 equipped with the check ball to open is infixed, and this oilway 103 is connected to the orifice control valve 105 explained below.

[0023] The orifice control valve 105 is 2nd brake B-2. In the port 107 which is a bulb for controlling the exhaust-gas-pressure speed of a shell, and was formed in pars intermedia so that it might be opened and closed with the spool 106, it is 2nd brake B-2. It connects and the aforementioned oilway 103 is connected to the port 108 formed in the drawing bottom from this port 107. 2nd brake B-2 From the connected port 107, the port 109 formed in the drawing bottom is a port alternatively made open for free passage in a drain port, and the port 111 of the B-3 aforementioned control valve 78 is connected to this port 109 through the oilway 110. In addition, this port 111 is the 3rd brake B3. It is the port alternatively made open for free passage by the connected output port 83.

[0024] The control port 112 formed in the edge of an opposite side is connected with the spring which presses a spool 106 among the ports of the orifice control valve 105 through the oilway 113 in the port 114 of the 3-4 shift bulb 72. This port 114 is a port which outputs ***** of the 3rd solenoid valve SL 3 for a gear ratio [3rd / less than] gear ratio, and outputs ***** of the 4th solenoid valve SL 4 for a gear ratio [4th / more than] gear ratio. Furthermore, the oilway 115 which branched from the aforementioned oilway 95 is connected to this orifice control valve 105, and a drain port is made to open this oilway 115 for free passage alternatively.

[0025] In addition, the port 116 which outputs D-range ** for a gear ratio [2nd / less than] gear ratio in the aforementioned 2-3 shift bulb 71 is connected to the port 117 which carries out opening to the part which has arranged the spring 92 among the aforementioned 2-3 timing bulbs 89 through the oilway 118. Moreover, the port 119 made open for free passage by the aforementioned oilway 87 is connected to the solenoid relay valve 100 through the oilway 120 for the gear ratio [3rd / less than] gear ratio among the 3-4 shift bulbs 72.

[0026] A sign 121 is 2nd brake B-2. ***** PSLN which shows the accumulator of ** and the linear solenoid valve SLN outputs to the back pressure room Accumulator control ** Pac whose pressure was responded and regulated is supplied. if the aforementioned 2-3 shift bulb 71 is switched at the time of 2 -> 3 gear change -- 2nd brake B-2 **** -- although D-range ** (line pressure PL) is supplied through an oilway 87, piston 121p of an accumulator 121 starts elevation by this line pressure PL while this piston 121p is

going up -- brake B-2 abbreviation which balances with above-mentioned accumulator control ** Pac to which the oil pressure (*****) PB2 supplied energizes the spring 121s downward energization force and piston 121p downward -- it is made to increase gradually in connection with a spring 121s compression set uniformly and strictly, and if piston 121p arrives at an elevation edge, it will be raised to line pressure PL. That is, ***** PB2 of the gear change transient which piston 121p moves becomes settled by accumulator control ** Pac.

[0027] Accumulator control ** Pac is above-mentioned 2nd brake B-2 by which engagement control is carried out at the time of the 3rd gear ratio formation. Others [accumulator / of ** / 121], Illustration is the clutch C1 by which engagement control is carried out at the time of the 1st gear ratio formation although omitted. The accumulator of **, Clutch C2 by which engagement control is carried out at the time of the 4th gear ratio formation. The accumulator of **, and brake B0 by which engagement control is carried out at the time of the 5th gear ratio formation. The accumulator of ** is also supplied and the transient oil pressure at the time of engagement and release of that etc. is controlled.

[0028] The sign 122 of drawing 4 shows C-0 exhaust valve, and a sign 123 is a clutch C0 further. The accumulator of ** is shown. C-0 exhaust valve 122 is a clutch C0 in order to make engine brake effective only in the 2nd gear ratio in a 2nd speed range. It operates so that you may make it engaged.

[0029] According to such a hydraulic circuit 44, it is the gear change B3 for the 3rd gear ratio from the 2nd gear ratio, i.e., the 3rd brake. While releasing, it is 2nd brake B-2. In the engaged so-called clutch two clutch gear change, it is based on the input torque of an input shaft 26 etc., and is the 3rd brake B3. Release transient oil pressure and 2nd brake B-2 By controlling engagement transient oil pressure, a gear change shock is suitably mitigable. It is a clutch C1 and C2 by regulating the pressure of accumulator control ** Pac by duty control of the linear solenoid valve SLN also about other gear changes. Brake B0 Transient oil pressure is controlled.

[0030] The hybrid driving gear 10 is equipped with the controller 50 for hybrid control, and the controller 52 for automatic gear change control as shown in drawing 2. These controllers 50 and 52 are equipped with the microcomputer which has CPU, RAM, ROM, etc., and are constituted. From the accelerator control input sensor 62, the vehicle speed sensor 63, the input shaft rotational frequency sensor 64, and the pattern selection switch 65, respectively Accelerator control input thetaAC, The rotational frequency NI of the input shaft 26 of the vehicle speed V (it corresponds to the rotational frequency NO of the output shaft 19 of an automatic transmission 18), and an automatic transmission 18, The signal showing a selection pattern is supplied, and also it is an engine torque TE. The motor torque TM Signal processing is performed according to the program which the information about the amount SOC of accumulation of electricity of an engine speed NE, the motor rotational frequency NM, and accumulation-of-electricity equipment 58, ON of a brake, OFF, the operation range of a shift lever 40, etc. was supplied from various detection means etc., and was set up beforehand. Accelerator control input thetaAC is the control input of the accelerator operation means 48 operated by operators, such as an accelerator pedal, according to the output amount required. The pattern selection switch 65 is a pattern selection means, and can choose any of the power pattern which performs the run which thought the power performance as important, and the usual normal pattern they are. In addition, engine torque TE It asks from throttle-valve opening, fuel oil consumption, etc., and is the motor torque TM. It asks from motor current etc. and the amount SOC of accumulation of electricity is calculated from motor current, a charging efficiency, etc. at the time of the charge as which a motor generator 14 functions as a generator.

[0031] As for the aforementioned engine 12, according to operational status, such as accelerator control input thetaAC, an output is controlled by controlling throttle-valve opening, fuel oil consumption, ignition timing, etc. by the controller 50 for hybrid control. The motor generator 14 is connected to the accumulation-of-electricity equipments 58, such as a dc-battery, through the M/G controller (inverter) 56, as shown in drawing 5. by the controller 50 for hybrid control. The rotation drive state by which electrical energy is supplied from the accumulation-of-electricity equipment 58, and a rotation drive is carried out with predetermined torque, It is switched to the charge state of functioning as a generator with regenerative braking (electric damping torque of motor generator 14 the very thing), and charging electrical energy at accumulation-of-electricity equipment 58, and unladen [which permit that rotor-shaft 14r rotates freely]. Moreover, the 1st clutch CE 1 of the above It reaches and is the 2nd clutch CE 2. Engagement or a release state is switched by switching a hydraulic circuit 44 through a solenoid valve etc. by the controller 50 for hybrid control. According to the gear change pattern with which the automatic transmission 18 was beforehand set up according to operational status (for example, accelerator control input thetaAC, the vehicle speed V, etc.) by controlling the excitation state of the aforementioned solenoid valves SL1-SL4 and the linear solenoid valves SLU, SLT, and SLN, switching a hydraulic circuit 44 or performing an oil pressure control by the controller 52 for automatic gear change control, a gear ratio is switched automatically. Two kinds are prepared corresponding to the power pattern and normal pattern as which this gear change pattern is chosen by the aforementioned pattern selection switch 65.

[0032] The controller 50 for hybrid control chooses one of the nine operation modes shown in drawing 7 according to the flow chart shown in drawing 6, and operates an engine 12 and the electric-type torque converter 24 in the selected mode as indicated by Japanese Patent Application No. No. 294148 [seven to] for which the applicant for this patent applied previously.

[0033] In order to run an engine 12 whether there was any engine starting demand at Step S1 as a source of power in drawing 6, or to carry out the rotation drive of the motor generator 14 with an engine 12 and to charge accumulation-of-electricity equipment 58, it judges by whether there were any instructions of the purport which should put an engine 12 into operation, and if there is a starting demand, the mode 9 will be chosen at Step S2. It is the 1st clutch CE 1 so that clearly [the mode 9] from drawing 7. It is engaged (ON) and is the 2nd clutch CE 2. While being engaged (ON) and carrying out the rotation drive of the engine 12 through an epicyclic gear drive 16 by the motor generator 14, engine starting control of fuel injection etc. is performed and an engine 12 is put into operation. This mode 9 makes the aforementioned automatic transmission 18 neutral at the time of a vehicles halt, and is performed, and it is the 1st clutch CE 1 like the mode 1. At the time of the run carried out as the source of power only in the released motor generator 14, it is the 1st clutch CE 1. While being engaged, a motor generator 14 is operated with the output beyond a demand output required for a run, and it is carried out by carrying out the rotation drive of the engine 12 with the margin output. Moreover, even if it is at the vehicles run time, it is also possible to make an automatic transmission 18 neutral temporarily and to perform the mode 9.

[0034] a ***** [that there is a demand of damping force by performing Step S3 when judgment of Step S1 is denied (i.e. when there is no engine starting demand)] -- for example, a brake -- ON ***** -- the operation range of a shift lever 40 -- engine brake range,

such as L and 2, or DM range -- it is -- and accelerator control input $\theta_{AC} = 0$ ***** -- only -- accelerator control input $\theta_{AC} = 0$ ***** -- etc. -- it judges Step S4 is performed when this judgment is affirmed. At step S4, it judges whether it is more than the amount B of the maximum accumulation of electricity as which the amount SOC of accumulation of electricity of accumulation-of-electricity equipment 58 was determined beforehand, if it is $SOC \geq B$, the mode 8 will be chosen at Step S5, and if it is $SOC < B$, the mode 6 will be chosen at Step S6. It is the maximum amount of accumulation of electricity in which charging electrical energy is permitted, and, as for the amount B of the maximum accumulation of electricity, about 80% of value is set as accumulation-of-electricity equipment 58 based on the charge-and-discharge efficiency of accumulation-of-electricity equipment 58 etc.

[0035] As the mode 8 chosen at the above-mentioned step S5 is shown in drawing 7, it is the 1st clutch CE 1. It is engaged (ON). The 2nd clutch CE 2 It is engaged (ON) and a motor generator 14 is made unladen. It is what sets fuel oil consumption to 0 while closing a idle state, i.e., a throttle valve, for an engine 12. The damping force by length grinding rotation of an engine 12 or the pump action, i.e., engine brake, is made to act by vehicles by this, the brakes operation by the operator is mitigated, and operation becomes easy. Moreover, since a motor generator 14 is made unladen and it is made to rotate freely, the amount SOC of accumulation of electricity of accumulation-of-electricity equipment 58 becoming excessive, and spoiling performances, such as charge-and-discharge efficiency, is avoided.

[0036] It is the 1st clutch CE 1 so that clearly [the mode 6 chosen at Step S6] from drawing 7. It releases (OFF). The 2nd clutch CE 2 It is what is engaged (ON), suspends an engine 12 and makes a motor generator 14 a charge state. While charging accumulation-of-electricity equipment 58 by carrying out the rotation drive of the motor generator 14 by the kinetic energy of vehicles, in order to make regenerative-braking force like engine brake act on the vehicles, the brakes operation by the operator is mitigated and operation becomes easy. Moreover, the 1st clutch CE 1 Since it performs when there are few amounts SOC of accumulation of electricity than the amount B of the maximum accumulation of electricity while there is no energy loss by the rotational resistance of the engine 12, since it is released and the engine 12 is intercepted, the amount SOC of accumulation of electricity of accumulation-of-electricity equipment 58 becomes excessive, and performances, such as charge-and-discharge efficiency, are not spoiled.

[0037] the time $V \rightarrow 0$ of a vehicles halt under run which makes the engines 12, such as the mode 3, the source of power for whether Step S7 is performed when judgment of Step S3 is denied (i.e., when there is no demand of damping force), and engine start is demanded, i.e., the vehicle speed, ***** -- etc. -- it judges When this judgment is affirmed, in Step S8, it judges whether that it is ON, i.e., accelerator control input θ_{AC} , has an accelerator larger than the predetermined value of abbreviation 0, and, in the case of Accelerator ON, the mode 5 is chosen by step S9, and if an accelerator is not ON, the mode 7 will be chosen at Step S10.

[0038] It is the 1st clutch CE 1 so that clearly [the mode 5 chosen by the above-mentioned step S9] from drawing 7. It is engaged (ON) and is the 2nd clutch CE 2. Vehicles are started by releasing (OFF), making an engine 12 into operational status, and controlling the regenerative-braking torque of a motor generator 14. If it explains concretely, it is ρE about the gear ratio of an epicyclic gear drive 16. If it carries out Engine torque TE : The output torque of an epicyclic gear drive 16: Motor torque $T_M = 1:(1+\rho E):\rho E$ Since it becomes, For example, if gear ratio ρE is made about [which are a general value] into 0.5, it is an engine torque TE. When a motor generator 14 shares half torque, it is an engine torque TE. About 1.5 times as many torque as this is outputted from carrier 16c. Namely, $(1+\rho E)/\rho E$ of the torque of a motor generator 14 High torque start of twice can be performed. Moreover, the output from carrier 16c will be set to 0 only by intercepting motor current and unladen, then rotor-shaft 14r being made to rotate reversely a motor generator 14, and it will be in a vehicles idle state. Namely, the epicyclic gear drive 16 in this case functions as a start clutch and a torque amplifying device, and is the motor torque (regenerative-braking torque) T_M . By making it increase gradually from 0 and enlarging reaction force, it is an engine torque TE. Vehicles can be smoothly started by the twice $(1+\rho E)$ as many output torque as this.

[0039] Here, at this example, it is abbreviation ρE of the maximum torque of an engine 12. It is small as much as possible, the motor generator 14 of small capacity is used, securing the motor generator of a twice as many torque capacity as this, i.e., required torque, and equipment is constituted cheaply small. Moreover, at this example, it is the motor torque T_M . Engine speed NE accompanying corresponding to increase increase throttle-valve opening and fuel oil consumption, enlarge the output of an engine 12, and] increase of reaction force The engine stole resulting from a fall etc. is prevented.

[0040] It is the 1st clutch CE 1 so that clearly [the mode 7 chosen at Step S10] from drawing 7. It is engaged (ON) and is the 2nd clutch CE 2. The output to the input shaft 26 of an automatic transmission 18 serves as zero by releasing (OFF), making an engine 12 into operational status, making a motor generator 14 neutral electrically as unladen, and making rotor-shaft 14r of a motor generator 14 rotate freely to an opposite direction. While not stopping an engine 12 one by one by this at the time of a vehicles halt under run which makes the engines 12, such as the mode 3, the source of power, engine start of the aforementioned mode 5 becomes possible substantially.

[0041] the 1st to which Step S11 was performed when judgment of Step S7 was denied (i.e., when there is no demand of engine start), and the demand output P_d was set beforehand -- it judges whether it is less than [decision value P_1] The demand output P_d is an output required for the rolling stock run containing running resistance, and is computed by a data map, operation expression, etc. which were defined beforehand based on accelerator control input θ_{AC} , the gear ratio of the change speed, the vehicle speed V (output rotational frequency NO), and an automatic transmission 18, etc. Moreover, while running only an engine 12 as a source of power, the 1st decision value P_1 is a boundary value of a load field and the low load field which runs only a motor generator 14 as sources of power, and is set that the amount of exhaust gases, fuel consumption, etc. decrease as much as possible by experiment etc. in consideration of energy efficiency including the time of charge with an engine 12.

[0042] the demand output P_d when judgment of Step S11 is affirmed -- the 1st -- if it is $SOC < A$ while judging whether it is more than the amount A of the minimum accumulation of electricity to which the amount SOC of accumulation of electricity was beforehand set at Step S12, and choosing the mode 1 at Step S13 if it is $SOC \geq A$ in being less than [decision value P_1], the mode 3 will be chosen at Step S14 When the amount A of the minimum accumulation of electricity runs a motor generator 14 as a source of power, taking out

electrical energy from accumulation-of-electricity equipment 58 is the minimum amount of accumulation of electricity permitted, and about 70% of value is set up based on the charge-and-discharge efficiency of accumulation-of-electricity equipment 58 etc.

[0043] It is the 1st clutch CE 1 so that clearly [the above-mentioned mode 1] from aforementioned drawing 7 . It releases (OFF) and is the 2nd clutch CE 2. It is engaged (ON), an engine 12 is suspended, the rotation drive of the motor generator 14 is carried out with the demand output Pd, and it is made to run vehicles by making only a motor generator 14 into the source of power. Since the 1st clutch CE 1 is released also in this case and an engine 12 is intercepted, it lengthens like the aforementioned mode 6, and there is little grinding loss and efficient motorised control is possible by carrying out gear change control of the automatic transmission 18 suitably. moreover, this mode 1 -- the demand output Pd -- the 1st -- the low load field not more than decision value P1 -- and since it performs when the amount SOC of accumulation of electricity of accumulation-of-electricity equipment 58 is more than the amount A of the minimum accumulation of electricity, while energy efficiency is excellent and being able to reduce mpg and an exhaust gas rather than the case where it runs an engine 12 as a source of power, the amount SOC of accumulation of electricity of accumulation-of-electricity equipment 58 falls from the amount A of the minimum accumulation of electricity, and does not spoil performances

[0044] It is the 1st clutch CE 1 so that clearly [the mode 3 chosen at Step S14] from drawing 7 . It reaches and is the 2nd clutch CE 2. The electrical energy generated by the motor generator 14 is charged at accumulation-of-electricity equipment 58, it both being engaged (ON), making an engine 12 into operational status, making a motor generator 14 into a charge state with regenerative braking, and making it run vehicles with the output of an engine 12. It is made to operate an engine 12 with the output beyond the demand output Pd, and current control of the motor generator 14 is performed so that it may be consumed by the motor generator 14 by larger margin power than the demand output Pd.

[0045] When judgment of Step S11 is denied (i.e., when the demand output Pd is larger than the 1st decision value P1), in Step S15, it judges whether they are whether the demand output Pd is more greatly [than the 1st decision value P1] smaller than the 2nd decision value P2 and $P1 < Pd < P2$. The 2nd decision value P2 is a boundary value of the heavy load field which runs as a source of power both a load field, an engine 12, and the motor generator 14 while running only an engine 12 as a source of power, and is beforehand set that the amount of exhaust gases, fuel consumption, etc. decrease as much as possible by experiment etc. in consideration of energy efficiency including the time of charge with an engine 12. And if it is $P1 < Pd < P2$, it will judge whether it is $SOC \geq A$ at Step S16, and in $SOC \geq A$, the mode 2 is chosen at Step S17, and, in $SOC < A$, the mode 3 is chosen at the aforementioned step S14. Moreover, if it is $Pd \geq P2$, it will judge whether it is $SOC \geq A$ at Step S18, and in $SOC \geq A$, the mode 4 is chosen at Step S19, and, in $SOC < A$, the mode 2 is chosen at Step S17.

[0046] It is the 1st clutch CE 1 so that clearly [the above-mentioned mode 2] from aforementioned drawing 7 . It reaches and is the 2nd clutch CE 2. It is both engaged (ON), an engine 12 is operated with the demand output Pd, a motor generator 14 is made unladen, and it is made to run vehicles by making only an engine 12 into the source of power. Moreover, the mode 4 is the 1st clutch CE 1. It reaches and is the 2nd clutch CE 2. It is both engaged (ON), an engine 12 is made into operational status, the rotation drive of the motor generator 14 is carried out, and the high power run of the vehicles is carried out by making both an engine 12 and the motor generator 14 into the source of power. this mode 4 -- the demand output Pd -- the 2nd -- although it performs in the heavy load field beyond decision value P2, since the engine 12 and the motor generator 14 are used together, as compared with the case where it runs as a source of power either an engine 12 and the motor generator 14, energy efficiency is not spoiled remarkably, and mpg and an exhaust gas can be reduced. Moreover, since it performs when the amount SOC of accumulation of electricity is more than the amount A of the minimum accumulation of electricity, the amount SOC of accumulation of electricity of accumulation-of-electricity equipment 58 falls from the amount A of the minimum accumulation of electricity, and does not spoil performances, such as charge-and-discharge efficiency.

[0047] If it is amount $SOC \geq A$ of accumulation of electricity when the service condition in the above-mentioned modes 1-4 is summarized In the low load field of $Pd \leq P1$, choose the mode 1 at Step S13, and it runs only a motor generator 14 as a source of power. In the inside load field of $P1 < Pd < P2$, the mode 2 is chosen at Step S17, and it runs only an engine 12 as a source of power, and in the heavy load field of $P2 \leq Pd$, the mode 4 is chosen at Step S19, and it runs as a source of power both an engine 12 and the motor generator 14. moreover -- although accumulation-of-electricity equipment 58 is charged by performing the mode 3 of Step S14 in the inside low load field where the demand output Pd is smaller than the 2nd decision value P2 in $SOC < A$ -- the demand output Pd -- the 2nd -- a high power run is performed by the engine 12 in the heavy load field beyond decision value P2, without charging by choosing the mode 2 at Step S17

[0048] Although the mode 2 of Step S17 is the inside load field of $P1 < Pd < P2$, is the case of $SOC \geq A$, or the heavy load field of $Pd \geq P2$ and is performed in $SOC < A$, since the engine 12 generally excels [field / inside load] the motor generator 14 in energy efficiency, it can reduce mpg and an exhaust gas in it as compared with the case where it runs a motor generator 14 as a source of power. Moreover, although the mode 4 which uses together and runs a motor generator 14 and an engine 12 is desirable in a heavy load field, when the amount SOC of accumulation of electricity of accumulation-of-electricity equipment 58 is smaller than the amount A of the minimum accumulation of electricity, it is avoided by performing operation which makes only the engine 12 by the above-mentioned mode 2 the source of power that the amount SOC of accumulation of electricity of accumulation-of-electricity equipment 58 becomes less than the amount A of the minimum accumulation of electricity, and spoils performances, such as charge-and-discharge efficiency.

[0049] The controller 50 for hybrid control performs assistant control by the motor generator 14 by an operator's selection etc. again according to the flow chart shown in drawing 9 apart from the above-mentioned mode change control. The portion which performs Steps SA4-SA8 of drawing 9 among a series of signal processing by the controller 50 for hybrid control is functioning as assistant control means according to claim 1.

[0050] drawing 9 -- fundamental -- an engine 12 -- as the source of power -- running (equivalent to the mode 2 of drawing 7) -- it performs at the time of increase of accelerator control input θ_{AC} by the case (equivalent to the mode 4 of drawing 7) where it assists by the motor generator 14 under predetermined conditions Although the operation range of a shift lever 40 judges whether they are "4", "D", or "DM" based on the signal from the shift position sensor 46, and two or less step SA will be performed at a step SA 1 if

it is YES, in NO, according to the increase in accelerator control input θ_{AC} , the usual engine output increase control is performed at a step SA 9. This engine output increase control includes an increase-in-quantity amendment of fuel-injection control etc.

[0051] Although it judges based on run states, such as relation between for example, accelerator control input θ_{AC} and the vehicle speed V, for whether it is a gap ground run, and four or less step SA will be performed at a step SA 2 if it is a gap ground run, when it is not a gap ground run, a step SA 3 is performed. Although it judges whether it is "DM" range based on the signal from the direct mode switch 41, and four or less step SA will be performed at a step SA 3 if it is "DM" range, if it is not "DM" range, the aforementioned step SA 9 will be performed. In addition, still more nearly another execution condition, such as performing four or less step SA, when the power pattern is chosen by the pattern selection switch 65, can also be added, execution conditions, such as it, are omitted, and it may always be made to perform four or less step SA.

[0052] At a step SA 4, it judges whether it is beyond the predetermined value α as which the increase width of face ($\theta_{AC2}-\theta_{AC1}$) of accelerator control input θ_{AC} in predetermined times, such as about 1 etc. second, was determined beforehand, for example, and if it is $\geq (\theta_{AC2}-\theta_{AC1}) \alpha$, a step SA 5 will be performed. At a step SA 5, it judges whether it is beyond the predetermined value β as which rate-of-increase $d\theta_{AC}/dt$ of accelerator control input θ_{AC} which is the augend of per a read in cycle (for example, dozens of ns) of data, for example was determined beforehand, and if it is $d\theta_{AC}/dt \geq \beta$, a step SA 6 will be performed. It is determined that the predetermined values α and β , such as this, judge a rapid accelerator change by which NVH, mpg, and emission are spoiled greatly, and, in NO, the aforementioned step SA 9 is performed.

[0053] At a step SA 6, it judges whether the amount SOC of accumulation of electricity is usable as an electrical motor that it is [14] more than the aforementioned amount A of the minimum accumulation of electricity, i.e., a motor generator, and if it is $SOC \geq A$, the rotation drive of the motor generator 14 will be carried out at a step SA 7, torque assistance will be performed, and a step SA 8 will perform output increase control of an engine 12. Engine output increase control of a step SA 8 is what was deducted from the usual amount of output increases based on a size, rate-of-increase $d\theta_{AC}/dt$, etc. of accelerator control input θ_{AC} by the torque assistance by the motor generator 14, and as a solid line shows to drawing 10, an engine torque T_M is raised gently. The dashed line of drawing 10 is TT of the bottom column by the case where the torque assistance by the motor generator 14 is not performed. Motor torque T_M Engine torque T_M It is the doubled total torque.

[0054] Aggravation of NVH resulting from a rapid output change of an engine 12, mpg, and emission is prevented maintaining a predetermined acceleration performance, since according to the hybrid driving gear 10 of such this example the torque assistance by the motor generator 14 is performed at the time of the increase in accelerator control input θ_{AC} and output change of an engine 12 is suppressed by the torque assistance.

[0055] When the increase in accelerator control input θ_{AC} is larger than predetermined in this example especially, Increase width of face ($\theta_{AC2}-\theta_{AC1}$) specifically above the predetermined value α And when rate-of-increase $d\theta_{AC}/dt$ is beyond the predetermined value β , in order to perform the torque assistance by the above-mentioned motor generator 14, As compared with the case where the torque assistance by the motor generator 14 is always performed, the operating frequency and power consumption of a motor generator 14 are reduced at the time of the increase in accelerator control input θ_{AC} . Thereby, it originates in the torque assistance by the motor generator 14, and problems -- enlarge accumulation-of-electricity capacity of accumulation-of-electricity equipment 58, or endurance of a motor generator 14 is spoiled -- are avoided.

[0056] In addition, aggravation of NVH, mpg, and emission Since it becomes remarkable especially when the increase in accelerator control input θ_{AC} is large, when the increase in accelerator control input θ_{AC} is smaller than predetermined, Specifically, when increase width of face ($\theta_{AC2}-\theta_{AC1}$) is smaller than the predetermined value α , or when rate-of-increase $d\theta_{AC}/dt$ is smaller than the predetermined value β , even if an engine output is increased according to the increase, NVH, mpg, and emission are not spoiled greatly.

[0057] Next, one example of the 2nd invention is explained, referring to the flow chart of drawing 11. In addition, the portion which the flow chart of this drawing 11 is performed at the time of the run which makes an engine 12 the source of power, and performs Steps SB4-SB11 among a series of signal processing by the controller 50 for hybrid control is functioning as assistant control means according to claim 2.

[0058] At Step SB1, injection time control of a gasoline judges whether it is an after [starting] injection time field, and if it is after starting] injection time, two or less step SB will be performed. The injection time after starting is the control which calculates injection time based on inhalation air mass information, and is distinguished from the injection time at the time of starting which is not based on inhalation air mass information. Although it judges whether the amount SOC of accumulation of electricity is usable as an electrical motor that it is [14] more than the aforementioned amount A of the minimum accumulation of electricity, i.e., a motor generator, and three or less step SB will be performed at Step SB2 if it is $SOC \geq A$, in $SOC < A$, the engine output control usual at Step SB12 is performed.

[0059] Gasoline injection time [in / the crank angle synchronous injection control after starting / if here explains one example about the above-mentioned usual engine output control, as it is indicated by the "automotive engineering series electronics control gasoline injection" (Sankai-Do issue), for example] TI The following formula (1) It follows and asks.

TI = TP x FC + TV ... (1) TI : Gasoline injection time TP : Basic injection time FC : Correction factor TV of basic injection time : Invalid injection time of an injector [0060] TP It is the injection time which realizes a predetermined air-fuel ratio (theoretical air fuel ratio 14.7 is generally set up), and is FC. TP It is the correction factor used when changing the air-fuel ratio to realize, and is this correction factor FC. For example, the following formula (2) Based on the shown parameter, it asks from a data map etc.

FC = g (FET, FAC, FDC, FO, floor line, and FH) ... (2) The correction factor FDC at the time of correction-factor FAC: acceleration operation in connection with FET: engine temperature: Correction factor FO at the time of slowdown operation : Feedback correction factor floor line to theoretical air fuel ratio : Correction factor FH by learning control : Correction factor at the time of a heavy load and quantity rotation operation [0061] The correction factor FAC at the time of the above-mentioned acceleration operation (acceleration correction factor) is equivalent to an increase-in-quantity amendment of the fuel oil consumption by the increase in an accelerator control input, and is the following formula (3). It follows and asks. FDL1 Evaporation speed is the thing of an amendment

sake about a bird clapper late, so that inlet-pipe internal pressure (inlet-pipe internal pressure is equivalent to a load) is high, and as a load, it is inhalation air-content Q/NE per charging stroke. Throttle-valve opening etc. is used and it etc. is predicted from change of accelerator control input θ_{AC} . Drawing 13 is FDL1. It is an example and is inhalation air-content Q/NE. Change $\Delta Q/NE$ It is a correction factor FDL1, so that it is large. It becomes large. In FTHW1, as evaporation speed is as slow as a low, and gasoline holdfast temperature is the thing of an amendment sake about a bird clapper, for example, it is shown in drawing 14, as for a correction factor FTHW1, a circulating water temperature becomes large like a low. In addition, correction factor FDL1 corresponding [using the rate of change of accelerator control input θ_{AC} etc. as a parameter] to the amount of changes of load It can ask.

$FAC = FDL1 \times FTHW1 \dots$ (3) FDL1 : The correction factor FTHW1 according to the amount of changes of load: Correction factor according to the circulating water temperature [0062] It returns to drawing 11 and is the above (3) at Step SB3. Predetermined value FAC^* as which the acceleration correction factor FAC in the usual engine output control was computed according to the formula, and the acceleration correction factor FAC was beforehand determined at Step SB4 ***** above is judged. predetermined value FAC^* it is determined that increase in quantity of NVH, mpg, and the rapid amount of gasoline injections by which emission is spoiled greatly is judged -- having -- $FAC \geq FAC^*$ it is -- if -- assistant control by the five or less step [SB] motor generator 14 is performed [0063] At Step SB5, the acceleration correction factor FAC is predetermined value FAC^* . Motor torque T_M it is made not to become large Amount of assistance ΔT_M 1 is computed. For example, $FAC \times FAC^*$ The difference of the engine output at the time of carrying out and the engine output at the time of using the actual acceleration correction factor FAC as it was is searched for, and the torque equivalent to the difference is computed as amount of assistance ΔT_M 1. And at Step SB6, a motor generator 14 is operated by amount of assistance ΔT_M 1, and it is $FAC = FAC^*$ at Step SB7. It carries out and is the gasoline injection time T_I . It asks and an engine output control, i.e., fuel-injection control, and throttle-valve control are performed. Drawing 12 is an example of a timing diagram when assistant control by such motor generator 14 is performed, and is an engine torque T_E . It rises gently. In addition, it is also possible to perform assistant control by the motor generator 14 so that acceleration correction-factor $FAC=1$, i.e., an increase-in-quantity amendment, may be set to 0.

[0064] $FAC < FAC^*$ when judgment of the aforementioned step SB4 is NO A case performs Step SB8 and is the crank angle asynchronous injection quantity T_B . Predetermined value T_B^* defined beforehand ***** above is judged. Crank angle asynchronous injection is emergency-injection at the time of the sudden acceleration which does not synchronize with a crank angle, is equivalent to an increase-in-quantity amendment of the fuel oil consumption by the increase in an accelerator control input, and is the asynchronous injection quantity T_B . For example, it asks from the data map and operation expression which make a parameter the rate of change of throttle-valve opening etc. Drawing 15 is the asynchronous injection quantity T_B . Although it is drawing showing an example of a relation with the rate of change of throttle-valve opening and the rate of change of the throttle-valve opening in this case is predicted from change of accelerator control input θ_{AC} , it is the asynchronous injection quantity T_B considering the rate of change of accelerator control input θ_{AC} etc. as a parameter. It can ask. predetermined value T_B^* it is determined that increase in quantity of NVH, mpg, and the rapid amount of gasoline injections by which emission is spoiled greatly is judged -- having -- $T_B \geq T_B^*$ it is -- if -- although assistant control by the nine or less step [SB] motor generator 14 is performed -- $T_B < T_B^*$ A case performs the aforementioned step SB12.

[0065] At Step SB9, it is the asynchronous injection quantity T_B . Predetermined value T_B^* Motor torque T_M it is made not to become large Amount of assistance ΔT_M 2 is computed. For example, $T_B \times T_B^*$ The engine output at the time of performing asynchronous injection, and actual asynchronous injection quantity T_B A difference with the engine output at the time of using as it is is searched for, and the torque equivalent to the difference is computed as amount of assistance ΔT_M 2. And at Step SB10, a motor generator 14 is operated by amount of assistance ΔT_M 2, and asynchronous injection control is performed as $T_B = T_B^*$ at Step SB11. In addition, it is the injection quantity T_B about the amount of assistance it is made to become below rate-of-change ΔT_H 0 (to refer to drawing 15) from which it becomes unnecessary asynchronous injecting the rate of change of throttle-valve opening. It can avoid performing asynchronous injection by asking from the augend of the engine output at the time of performing asynchronous injection control etc., and operating a motor generator 14 in the amount of assistance.

[0066] At this example, the acceleration correction factor FAC in synchronous injection control is predetermined value FAC^* . While being restricted to below, it is the injection quantity T_B of asynchronous injection control. Predetermined value T_B^* Aggravation of NVH which originates to a rapid output change of an engine 12, mpg, and emission is prevented maintaining a predetermined acceleration performance, in order to be restricted to below and to compensate the insufficiency of the torque accompanying the limit with the assistant control by the motor generator 14.

[0067] Here, fuel-injection control is accelerator control input θ_{AC} and also inhalation air-content Q/NE fundamentally. Since it is carried out by responding, there are comparatively few amounts of assistance by the motor generator 14. Especially, the acceleration correction factor FAC is predetermined value FAC^* . Injection quantity T_B of the above or asynchronous injection control Predetermined value T_B^* Only when it is above, in order to perform assistant control, the operating frequency and power consumption of a motor generator 14 are reduced. Thereby, it originates in the torque assistance by the motor generator 14, and problems -- enlarge accumulation-of-electricity capacity of accumulation-of-electricity equipment 58, or endurance of a motor generator 14 is spoiled -- are avoided.

[0068] As mentioned above, although the example of this invention was explained in detail based on the drawing, this invention can also be carried out in other modes.

[0069] For example, although the automatic transmission 18 which has the gear ratio of one step of go-astern and five steps of advance was used in the aforementioned example, as shown in drawing 16, the automatic transmission 60 which omits the aforementioned auxiliary transmission 20 and consists only of the main change gear 22 is adopted, and as shown in drawing 17, gear change control can be performed by four steps of advance, and one step of go-astern.

[0070] In addition, although instantiation is not carried out one by one, this invention can be carried out in the mode which added various change and improvement based on this contractor's knowledge.